(discussion). The detailed commentary is important, but it is the diagram that represents the mechanism. As just one example of the saliency of diagrams, Christian de Duve, whose role in discovering the lysosome will be discussed in detail in Chapter 5, recollects that his discovery of the lysosome was sparked by an unexpected failure in his biochemical investigation of a liver enzyme. "By some fortunate coincidence, my recent readings had included [two 1946 papers by Claude and] I immediately recalled Claude's diagrams showing the agglutination at *p*H 5 of both large and small granules, and concluded that our enzyme was likely to be firmly attached to some kind of subcellular structure" (de Duve, 1969, p. 5).

The importance scientists place on diagrams should lead us to question whether they are in fact superfluous. Are there reasons a scientist might prefer to represent certain information diagrammatically rather than propositionally? More importantly, are there different processes of reasoning with diagrams than with propositions such that an account of science that focused only on logical inference would fail to capture an important aspect of explanatory reasoning?

The motivation for using diagrams to represent mechanisms is obvious. Unlike linguistic representations (except those found in signed languages), diagrams make use of space to convey information. As the heart example revealed, spatial layout and organization is often critical to the operation of a mechanism itself. As in a factory, different operations occur at different locations. Sometimes this serves to keep operations separate from one another and sometimes it serves to place operations in association with one another. These spatial relationships can be readily shown in a diagram. Even when information about the specific spatial layout is lacking or not significant, one can use space in the diagram to relate or separate operations conceptually. Moreover, diagrams can take advantage of dimensions other than space that visual processing can access, including color and shape.[10]

Time is at least as important as space to the operation of a mechanism – one operation proceeds, follows, overlaps, or is simultaneous with another operation. This can be captured by using one of the spatial dimensions in a diagram to convey temporal order. This of course presents a problem: Most diagrams are two dimensional and this leaves just one dimension for everything other than time. One solution – as exemplified in the heart diagram – is

[10] These can either be iconic – representing the actual color or shape of the parts of a mechanism, or they can be symbolic. fMRI diagrams of brain activity are a well-known example of the symbolic use of color – colors scaled from hot to cold are used to represent such things as strong to weak activations or high to low statistical significance of the increase of the activation above some baseline.